

**This is the final draft, after peer-review, of a manuscript published in Journal of Clinical Epidemiology 65(7):793-797. The definitive version, detailed above, is available online at [www.sciencedirect.com](http://www.sciencedirect.com)**

## **Title**

Email invitations to general practitioners were as effective as postal invitations and were more time- and cost-efficient

## **Authors**

Shaun Treweek<sup>1</sup>, Karen Barnett<sup>1</sup>, Graeme MacLennan<sup>2</sup>, Debbie Bonetti<sup>3</sup>, Martin P Eccles<sup>4</sup>, Jill J Francis<sup>2</sup>, Claire Jones<sup>5</sup>, Nigel B Pitts<sup>3</sup>, Ian W Ricketts<sup>5</sup>, Mark Weal<sup>6</sup>, Frank Sullivan<sup>1</sup>

## **Addresses**

1. Population Health Sciences, University of Dundee, Kirsty Semple Way, Dundee DD2 4BF, UK
2. Health Services Research Unit, University of Aberdeen, Health Sciences Building, Foresterhill, Aberdeen AB25 2ZD, UK
3. Dental Health Services Research Unit, University of Dundee, Kirsty Semple Way, Dundee DD2 4BF, UK
4. Institute of Health and Society, Newcastle University, Baddiley Clark Building,, Richardson Road, Newcastle upon Tyne NE2 4AX, UK
5. School of Computing, University of Dundee, Queen Mother Building, Dundee DD1 4HN, UK
6. School of Electronics & Computer Science, University of Southampton, Highfield, Southampton SO17 1BJ, UK

**Corresponding author**

Shaun Treweek: [streweek@mac.com](mailto:streweek@mac.com)

**Conflict of interest**

All authors declare no conflict of interest.

**Contributorship**

All authors contributed to the design of the study. ST wrote the first draft of the paper and all authors contributed to the final version. All authors have approved the final manuscript. ST had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

## **Abstract**

**Objectives:** To evaluate which of two invitation methods, email or post, was most effective at recruiting general practitioners to an online trial.

**Study design and setting:** Randomised controlled trial. Participants were general practitioners in Scotland, UK.

**Results:** 270 general practitioners were recruited. Using email did not improve recruitment (risk difference = 0.7% (95% confidence interval -2.7% to 4.1%)). Email was, however, simpler to use and cheaper, costing £3.20 per recruit compared to £15.69 for postal invitations. Reminders increased recruitment by around 4% for each reminder sent for both invitation methods.

**Conclusions:** In the Scottish context, inviting general practitioners to take part in an online trial by email does not adversely affect recruitment and is logistically easier and cheaper than using postal invitations.

**Keywords:** recruitment, randomised controlled trials, email, primary care

**Running title:** Email vs post for recruitment

**Word count:** 1488

## **Introduction**

Randomised controlled trials are the gold-standard for the evaluation of the effectiveness and safety of healthcare interventions, particularly because they protect against selection bias [1]. However, recruiting clinicians and patients to randomised trials can be extremely difficult [2]. Trialists use many interventions to improve recruitment [3,4] but evidence regarding the likely effect of these interventions is often unclear.

Primary care studies face particular challenges linked to the characteristics of primary care professionals and patients and the dispersal of the primary care setting [5,6]. The Cochrane review of interventions to improve recruitment has a planned subgroup analysis comparing primary and secondary care recruitment but has not found enough primary care studies to perform the analysis, despite including a total of 45 studies [3]. More rigorous evaluations of recruitment interventions are needed, especially in primary care.

The web-based intervention modelling experiment (WIME) study [7] (ClinicalTrials.gov number NCT01206738) has the primary aim of running a web-based intervention modelling experiment (IME) to develop and evaluate theory-based interventions to improve antibiotic prescribing for upper respiratory tract infections in primary care. It also has an embedded trial evaluating which of two invitation methods, email or post, is most effective at recruiting general practitioners (GPs) to the study, which is the subject of this paper.

## **Intervention modelling experiments**

The Medical Research Council's framework for developing and evaluating complex interventions has argued for more and better theoretical and exploratory work prior to a trial as a means of improving intervention development [8]. The use of IMEs for

interventions that aim to change behaviour is one approach to doing exploratory work [9]. In an IME, key elements of the intervention are delivered (generally in a randomised controlled trial) in a manner that approximates the real world but the measured outcome is generally an interim outcome, a proxy for the clinical behaviour of interest (a clinical decision in response to a simulated clinical encounter) prior to entering the intervention into a full-scale trial. To date IMEs have been paper-based [9,10] but this may limit their efficiency, acceptability and ecological validity. Web-based IMEs have the potential to provide much richer simulations of clinical encounters and allow measurement of key process variables such as time to make a decision.

WIME aimed to recruit 250 GPs. The standard approach to invite GPs to take part in research is to use postal invitations but it was not clear whether GPs would be more likely to respond to a postal or email invitation. Email is increasingly used to contact GPs in Scotland about research (eg. by the Scottish Primary Care Research Network (SPCRN; [www.sspc.ac.uk/spcrn/](http://www.sspc.ac.uk/spcrn/)) and if successful as a recruitment method, email would offer the advantages of being simple and less resource intense. We therefore embedded a methodological study of how best to contact GPs by randomly allocating GPs to one of postal or email invitation.

## Methods

GPs from 12 Scottish Health Boards were identified by SPCRN using a combination of publicly available information provided by ISD Scotland (<http://www.isdscotland.org/isd/3793.html>) and restricted information held on the NHS.net database, the latter to provide email addresses. The study statistician (GM) generated a list of random numbers and participant IDs broken down into mailing blocks which SPCRN

used to randomly allocate GPs to receive either an email or postal invitation on a 1:1 basis without stratification. Blocks of invitations were sent out until the number of GPs recruited met or exceeded the required sample size of 250 GPs. All research staff, except SPCRN staff, were blind to GP recruitment allocation until the study database was locked.

GPs receiving a postal invitation received a one-page letter and a two-page information sheet. Together with general information, the letter contained a URL to the WIME system. GPs receiving an email invitation received an email containing the same text and URL as in the paper letter and a link to the same two-page information sheet. We sent two reminders to non-responders, the first at two weeks, the second at four weeks, using the same contact method as used for the initial invitation. Staff sending out the invitations and reminders also recorded how long they spent on these tasks.

GPs were offered a £20 gift voucher from a choice of outlets (Amazon, Argos, Boots, iTunes, Love2Shop, Marks & Spencer, or Starbucks) as an incentive to participate. GPs could also opt to receive no voucher. All of the vouchers were sent out by post because only two of the seven vouchers could be sent electronically and a single system simplified our procedures. A diagram of participant flow is given in Figure 1.

## **Analysis**

The number recruited for each of email and postal invitations was calculated using an intention to treat analysis, with undelivered emails and postal letters being classed as 'GP not recruited'. Dichotomous outcomes were compared using Fisher's exact test, voucher choices were compared using Pearson's chi-squared, and mean number of years qualified was compared using a t-test, all 2-sided and at the 5% level of significance. PASW

Statistics 18 (SPSS Inc, USA) was used for analysis. Cost and time data were to be presented descriptively.

## **Approvals**

WIME was approved by the Tayside Committee on Medical Research Ethics A, REC reference 10/S1401/54 and received NHS R&D approval from the 12 NHS Health Boards involved.

## **Results**

1760 invitations were sent, in four batches (250, 250, 250, 1010), distributed equally between email and postal invitations. The number of GPs recruited by each method is shown in Table 1. 293 GPs logged onto the WIME system, of which 270 completed the WIME materials. Using email did not improve recruitment (risk difference = 0.7% (95% confidence interval -2.7% to 4.1%)). Excluding undelivered emails and postal invitations from the analysis did not change this conclusion, although the risk difference was increased to 1.8%. The first round of reminders increased recruitment by 4.3% in the email group and 4.0% in the postal group; the increases obtained for the second round of reminders were 2.6% and 3.5% for email and post, respectively (Table 2).

In order to examine the relative resource intensity of the two methods, we examined the estimated time, in hours, spent preparing for, and sending out, the email and postal invitations and reminders (Table 3). Sending out postal invitations and reminders took approximately two working days longer (40 hours vs 26) than sending out emails. Once the materials and mail merge databases were in place, the bulk of the time spent on sending out postal invitations and postal reminders was printing materials, collating them

and putting them into envelopes. This did not get quicker with practice; it is intrinsically time-consuming. The vast majority of the effort linked to sending out emails was linked to cleaning the email addresses prior to starting the project. The ISD Scotland and NHS.net databases could only be linked by GP name, which led to some instances of the same name being linked to different postal and/or email addresses. The 21 hours spent cleaning the email addresses were used checking these multiple names to make sure they were not the same person.

The total amount of time spent sending out the invitations and reminders was 66 hours, the cost of which was estimated at approximately £1122 assuming mid-point Grade 6 on the UK university pay scale. Apart from staff time, the cost of sending out emails was considered to be free to WIME. The cost of materials and postage for sending postal invitations and reminders was estimated to be £1391. The total cost of the email invitations was therefore £442 compared to £2071 for the postal invitations, giving a cost-per-recruit of £3.20 for email and £15.69 for post. The total cost of sending the vouchers was estimated to be £371 (14 hours of staff time costing £238 plus £133 printing and post).

Table 4 shows GPs' voucher selections. Amazon and Marks and Spencer vouchers were by far the most popular choice. Amazon vouchers were particularly quick and simple to order and could have been sent electronically. The cost to the project of getting vouchers was their face value plus some of ST's time, which was not recorded but is estimated at around four hours. There were some problems ordering iTunes vouchers because Apple limits the amount that can be spent on iTunes printable vouchers to around £60 in a 30-day period. Apple's Helpdesk staff did increase this for WIME but buying iTunes vouchers was generally more difficult than buying any of the other vouchers.



## Discussion

Recruitment method did not significantly influence the number of GPs who agreed to participate in this study. However, the two recruitment methods did differ in the resources they required, with email being simpler and cheaper than sending postal invitations. Reminders were equally helpful for both recruitment methods, increasing recruitment by about 4% per reminder. Offering a wide choice of voucher to GPs is probably unnecessary. Based on our study, Amazon plus a well-respected local retailer (Marks & Spencer in our case), perhaps with iTunes and an option of receiving no voucher, would be attractive to almost all GPs.

We are not aware of other randomised studies comparing the effect of email and postal invitations on GP recruitment to a trial [3] so the results presented here would need to be confirmed in future studies. Moreover, there is the possibility that those responding to an email invitation may differ from those responding to a postal invitation. Our study was embedded in an existing trial so the data we had to compare GPs was limited to that needed for the main study: sex, years qualified and number of GPs in training (Table 1). We found no statistically significant differences between the email and postal groups for these factors but there may be others (eg. IT skills) where invitation method is important and for which we have no data. Some studies have investigated the impact of offering potential participants electronic ways to respond to surveys and found that these options had a lower response rate than standard postal questionnaires [11-14]. The studies by Crouch *et al* [11] and Nicholls *et al* [12] also involved primary care staff. WIME is itself an online study and it is unclear whether GPs (or other health professionals) would respond in the same way to an offline study; this also needs to be confirmed in future studies. In the

meantime, researchers will need to make a judgement about whether to use email as a replacement for postal invitations, or as a supplementary invitation method. The low cost of email certainly makes its use worth considering. We are optimistic that in the Scottish context at least, inviting GPs to take part in an (online) trial by email does not adversely affect recruitment and is logistically easier and cheaper than using postal invitations.

## **Acknowledgments**

We would like to thank the GPs who took part in this study. We would also like to thank Marie Pitkethly and Gail Morrison for their help and support in recruiting GPs to the study. WIME is funded by the Chief Scientist Office, grant number CZH/4/610. The Health Services Research Unit, University of Aberdeen, is core funded by the Chief Scientist Office of the Scottish Government Health Directorates

## References

1. Odgaard-Jensen J, Vist GE, Timmer A, Kunz R, Akl EA, Schünemann H, Briel M, Nordmann AJ, Pregno S, Oxman AD. Randomisation to protect against selection bias in healthcare trials. *Cochrane Database of Systematic Reviews* 2011, Issue 4. Art. No.: MR000012. DOI: 10.1002/14651858.MR000012.pub3.
2. McDonald AM, Knight RC, Campbell MK, Entwistle VA, Grant AM, Cook JA, Elbourne DR, Francis D, Garcia J, Roberts I, Snowdon C. What influences recruitment to randomised controlled trials? A review of trials funded by two UK funding agencies. *Trials* 2006;7:9.
3. Treweek S, Pitkethly M, Cook J, Kjeldstrøm M, Taskila T, Johansen M, Sullivan F, Wilson S, Jackson C, Jones R, Mitchell E. Strategies to improve recruitment to randomised controlled trials. *Cochrane Database of Systematic Reviews* 2010, Issue 4. Art. No.: MR000013. DOI: 10.1002/14651858.MR000013.pub5.
4. Watson JM, Torgerson DJ. Increasing recruitment to randomised trials: a review of randomised controlled trials. *BMC Medical Research Methodology* 2006, 6:34.
5. van der Wouden JC, Blankenstein AH, Huibers MJH, van der Windt DAWM, Stalman WAB, Verhagena AP. Survey among 78 studies showed that Lasagna's law holds in Dutch primary care research. *Journal of Clinical Epidemiology* 2007; 60: 819-824.
6. Bower P, Wallace P, Ward E, Graffy J, Miller J, Delaney B, Kinmonth AL. Improving recruitment to health research in primary care. *Family Practice* 2009; 26: 391–397.
7. Treweek S, Ricketts IW, Francis J, Eccles M, Bonetti D, Pitts NB, MacLennan G, Sullivan F, Jones C, Barnett K. Developing and evaluating interventions to reduce inappropriate prescribing by general practitioners of antibiotics for upper respiratory tract infections: a randomised controlled trial to compare paper-based and web-based modelling experiments. *Implementation Science* 2011, 6:16.
8. MRC. Developing and evaluating complex interventions: new guidance. Sept 2008.
9. Bonetti D, Eccles M, Johnston M, Steen N, Grimshaw J, Baker R, Walker A, Pitts N: Guiding the design and selection of interventions to influence the implementation of evidence-based practice: an experimental simulation of a complex intervention trial. *Social Science and Medicine* 2005; 60: 2135-2147.
10. Hrisos S, Eccles M, Johnston M, Francis J, Kaner EF, Steen N, Grimshaw J: An intervention modelling experiment to change GPs' intentions to implement evidence-based practice: using theory-based interventions to promote GP management of upper respiratory tract infection without prescribing antibiotics #2. *BMC Health Services Research* 2008, 8:10.

11. Crouch S, Robinson P, Pitts M. A comparison of general practitioner response rates to electronic and postal surveys in the setting of the National STI Prevention Program. *Aust N Z J Public Health*. 2011 Apr;35(2):187-9. doi: 10.1111/j.1753-6405.2011.00687.x. Epub 2011 Mar 7.
12. Nicholls K, Chapman K, Shaw T, Perkins A, Sullivan MM, Crutchfield S, Reed E. Enhancing Response Rates in Physician Surveys: The Limited Utility of Electronic Options. *Health Serv Res*. 2011 Apr 14. doi: 10.1111/j.1475-6773.2011.01261.x. [Epub ahead of print].
13. Leece P, Bhandari M, Sprague S, Swiontkowski MF, Schemitsch EH, Tornetta P, Devereaux PJ, Guyatt GH. Internet versus mailed questionnaires: a controlled comparison (2). *J Med Internet Res*. 2004 29; e39.
14. Raziano DB, Jayadevappa R, Valenzula D, Weiner M, Lavizzo-Mourey R. E-mail versus conventional postal mail survey of geriatric chiefs. *Gerontologist* 2001; 41:799-804.

## Table and figure legends

**Figure 1** Participant flow. Notes: 1) We did not apply for NHS Management Approval from Orkney and Shetland Health Boards so GPs based on Orkney and Shetland were not invited. 2) GPs were randomised in blocks until the required sample size of 250 was reached or exceeded. 3) These are undelivered postal invitations returned by Royal Mail, the main UK postal service. It may underestimate the number of undelivered postal invitations since letters addressed to a GP who had moved on may have been discarded by practice staff rather than returned to the study team.

**Table 1** Recruitment by invitation method.

**Table 2** Number recruited by email and post by stage of invitation.

**Table 3** Time, in hours, spent preparing for, and sending out, the email and postal invitations and reminders.

**Table 4** Voucher selections by the 270 GPs submitting a completed questionnaire. The voucher selections for the two groups (not presented here) were not statistically different ( $P=0.469$ ).

**Table 1** Recruitment by invitation method.

	Email	Post
Number of invitations sent	880	880
Number recruited (%)	138 (15.7)	132 (15.0)
ITT: Risk difference <sup>1</sup>	0.7% (95% confidence interval = -2.7% to 4.1%)	
Per-protocol: Risk difference <sup>2</sup>	1.8% (95% confidence interval = -1.7% to 5.3%)	
Respondent characteristics <sup>3</sup>	Email	Post
Number of men (%)	79 (57.2)	64 (48.5)
Mean years qualified (standard deviation)	22.3 (7.6)	20.8 (8.0)
Number of GPs in training (%)	30 (21.7)	30 (22.7)
<sup>1</sup> Intention to treat; undelivered emails (67) and letters (10) were treated as a No, along with all other non-responders. The difference between email and post was not significant (P=0.741). <sup>2</sup> Per protocol; undelivered emails and letters were excluded, giving email vs postal recruitment rates of 17.0% vs 15.2%, respectively. The difference was not significant (P=0.320). <sup>3</sup> The differences between groups were not significant for any characteristic (P=0.112, 0.110 and 1.000 for number of men, years qualified and number of GPs in training, respectively)		

**Table 2** Number recruited by email and post by stage of invitation.

	Email		Post	
	n	Cumulative recruitment rate % (n=880)	n	Cumulative recruitment rate % (n=880)
Initial invitation	77	8.8	66	7.5
1st reminder (2 weeks after initial invitation)	38	13.1	35	11.5
2nd reminder (2 weeks after 1st reminder)	23	15.7	31	15.0
<b>Total</b>	<b>138</b>	<b>15.7</b>	<b>132</b>	<b>15.0</b>

**Table 4** Voucher selections by the 270 GPs submitting a completed questionnaire. The voucher selections for the two groups (not presented here) were not statistically different (P=0.469).

Voucher	Number selected	%
Amazon	123	45.6
Argos	4	1.5
Boots	9	3.3
iTunes	19	7.0
Love2Shop	3	1.1
Marks & Spencer	106	39.3
Starbucks	1	0.4
GP opted to receive no voucher	5	1.9
	<b>270</b>	<b>100</b>